

## ABSTRACT

Methods, systems and apparatus for photo-processing of fluids,  
5 particularly complex fluids, such as blood products, pharmaceuticals, injectables and vaccines, are provided. The disclosed methods and systems employ non-laser light source(s) to generate monochromatic light energy, preferably in the range of 260 nm to 310 nm, for fluid treatment. Advantageous processing regimens and/or adjunct additives and/or agents may also be used to achieve desired and/or enhanced results, e.g.,  
10 inactivation of pathogens, bacteria and/or viruses, modulation of immune response, and/or leukoreduction. Particularly preferred embodiments include novel temperature control systems and geometric/structural arrangements that provide enhanced processing results and/or efficiencies. The disclosed methods, systems and apparatus achieve desirable results in a broad range of diagnostic, therapeutic and treatment applications,  
15 and generally provide enhanced operating efficiencies and/or processing results in application modalities that employ a broad range of photo-activated and/or photo-responsive materials and/or compounds.